

WEST COAST OFFICE

2101 FOURTH AVENUE, SUITE 820
SEATTLE, WASHINGTON 98121
PHONE 206-623-2935
FAX 206-623-2985

EAST COAST OFFICE

106 N. BARTOW STREET
CARTERSVILLE, GEORGIA 30120
PHONE 770-334-3952

Greenfield
Advisors

*Economic, Market
and Valuation Analysts*

Economic and Valuation Impacts
of a Proposed
Concentrated Animal Operation
on Kaua'i

John A. Kilpatrick, Ph.D., MAI, FRICS

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1. Introduction

I am John A. Kilpatrick, Ph.D., MAI, FRICS, Chairman and Co-Managing Director of Greenfield Advisors, a boutique consulting firm specializing in complex real estate and related issues. More specifically, I have authored the two authoritative articles on the valuation impacts of concentrated animal operations which appeared in 2001 and 2015 in *The Appraisal Journal*, the peer-reviewed, official publication of the Appraisal Institute. A synopsis of my professional qualifications is attached to this document as an appendix.

I have been asked by the Friends of Maha'ulepu to evaluate the impacts of the proposed concentrated dairy cattle operation on surrounding property values and on the overall economy of Kaua'i. My evaluation is based on my professional experience as an appraiser and an economist, on the salient scholarly literature and other professional studies on this subject, my personal inspections of the areas to be affected by the CAFO¹, my interviews with residents of the island, and on salient economic theory and practice. It is my professional determination that:

- Properties downwind of this proposed facility, and particularly properties between the facility and the shoreline, will be diminished in value by 50% or more.
- The remainder of the island, and its residents, will feel additional negative economic impacts as a result of the damage to the Kaua'i tax base, loss of jobs (particularly in the tourism industry), increased public sector costs, and opportunity costs arising from the pollution of natural resources.

The remainder of this report outlines and summarizes the basis for these findings.

2. Background

Hawai'i Dairy Farms (HDF) proposes to construct a concentrated animal feeding operation (CAFO) on a 557-acre² portion of TMK (4)2-9-003:001 in Maha'ulepu Valley. I have been informed that initially,

¹ Code of Federal Regulation, 40 C.F.R. §122.23 defines Animal Feeding Operations ("AFO") and also defines Concentrated Animal Feeding Operations ("CAFO"). As set forth in 40 CFR §122.23(b)(2) CAFO means an AFO that is defined as a Large CAFO or as a Medium CAFO by the terms of §122.23 §122.23(b)(4) Large concentrated animal feeding operation ("Large CAFO"). (i) 700 mature dairy cows, whether milked or dry; §122.23(b)(6) Medium concentrated animal feeding operation ("Medium CAFO"). (A) 200 to 699 mature dairy cows, whether milked or dry;

² I note that the property size appears to have changed slightly from the original proposed size of 578 acres.

the CAFO will be stocked with 699 pregnant dairy cows.³ Within several weeks, these cows will give birth, nominally doubling the size of the herd. At an undisclosed time, presumably in the near future after that, the herd will max-out at 2,000 head⁴. Pennsylvania State University estimates that cattle of this size will produce in excess of 100 pounds of manure per cow per day.⁵ I have seen estimates, apparently part of the permit filings for this CAFO, placing the total at between 75 and 150 pounds per cow per day. Thus, at full capacity, this proposed CAFO will produce about 100 tons of manure per day, or over 35,000 tons of manure per year. In my studies of CAFOs, I've found that this manure concentration leads to problems with odors, airborne and waterborne pollution, and insects and other pests. Naturally, property values in affected areas diminish, as the use and enjoyment of properties decrease and marketability of these properties decrease as well. Local businesses and thus the local tax base and economy also suffer.

Hrarber and Schultz (2010), writing for the National Association of Local Boards of Health, note that CAFOs were known pollution problems as far back as the 1972 Clean Water Act. This act identified CAFOs (called "feedlots") as "point sources" for pollution along with other industries, such as fertilizer manufacturing. Consequently, a permit program entitled the National Pollutant Discharge Elimination System ("NPDES") was created which set effluent limitation guidelines and standards for CAFOs. CAFOs have been regulated by NPDES or a state equivalent since the mid-1970s.⁶

According to the EPA, a dairy cattle operation of this size⁷ is automatically considered in the largest category of concentrated animal feeding operations, and is thus automatically regulated under the Clean Water Act. Burkholder, et al., (2006), writing in the journal *Environmental Health Perspectives*, note the numerous public health and environmental risks associated with these facilities. While I am not an environmental scientist *per se*, a physical scientist, or a physician, I am aware of and familiar with these environmental and epidemiological concerns as a function of my real estate consulting practice. In short, these concerns have significant impacts on real estate markets, and thus on real estate values, and by extension on local economies⁸. These impacts include, but are not limited to, pathogens, veterinary

³ Readers familiar with CAFO regulation will note that this number is apparently not random – it is exactly one cow lower than the threshold for a "LARGE CAFO," which would automatically be regulated under the Clean Water Act. However, as these cows will all be pregnant, this advantage quickly dissipates.

⁴ See letter from Group 70 International to State Department of Health dated May 25, 2016.

⁵ "Average daily production and total content of manure", Pennsylvania State University College of Agricultural Sciences, 2016

⁶ Hribar, Carrie, and Mark Schultz, *Understanding Concentrated Animal Feeding Operations and Their Impact on Communities* (Bowling Green, OH: National Association of Local Boards of Health, 2010).

⁷ 700 head of cattle or above; I understand that HDF has committed to a herd size of at least 699, but is anticipating expansion to 2,000 cows.

⁸ Burkholder, JoAnn, Bob Libra, Peter Weyer, Susan Heathcote, Dana Kolpin, Peter Thorne, and Michael Wichman, "Impacts of Waste from Concentrated Animal Feeding Operations on Water Quality," *Environmental Health Perspectives* 115-2, February, 2007, 308-312.

pharmaceuticals, heavy metals, hormones, pesticides, and nutrient-contaminants such as nitrogen and phosphorus. Burkholder, et al. are particularly critical of the impact of these substances on surrounding, adjacent, and proximate water sources, such as waterways, groundwater, water used for nearby agriculture or native crop/animal life, and aquifers. They note:

The impacts from CAFO pollutant loadings to direct runoff are more substantial after such major effluent spills or when CAFOs are flooded and in direct contact with surface waters... Although the acute impacts are often clearly visible—dead fish floating on the water surface, or algal overgrowth and rotting biomass—the chronic, insidious, long-term impacts of commonly accepted practices of CAFO waste management on receiving aquatic ecosystems are also significant...

Indeed, even the Union of Concerned Scientists have weighed in on the negative local impacts of CAFOs. They detail that manure can cause the death of aquatic plant life that robs the marine environments of the oxygen that fish and many other aquatic organisms need to survive. They estimate that manure run-off from CAFOs contributes about 15 percent of the nutrient pollution that reaches the Gulf of Mexico...

...where a large “dead zone”—devoid of fish and commercially important seafood such as shrimp—has developed. CAFO manure also contributes to similar dead zones in the Chesapeake Bay (another important source of fish and shellfish) and other important estuaries along the East Coast. The Chesapeake Bay’s blue crab industry, which had a dockside value of about \$52 million in 2002, has declined drastically in recent years along with other important catches such as striped bass, partly due to the decline in water quality caused in part by CAFOs.⁹

They also detail the air pollution problem from CAFOs, noting that ammonia, a respiratory irritant, can combine with other air pollutants to form fine particulate matter leading to respiratory disease. Ammonia is also re-deposited onto the ground nearby, potentially impacting biodiversity. Ammonium ion deposition also contributes to the acidification of some forest soils. This ammonia may exceed the capacity of forests and other environments to absorb it, leading to harm to these surrounding forests.

⁹ Gurian-Sherman, Doug, *CAFOs Uncovered: The Untold Costs of Confined Animal Feeding Operations*, Union of Concerned Scientists, April, 2008.

The scientists also found that CAFO manure run-off pollutes nearby drinking water wells. One study in Missouri found pollution from CAFOs in 42% of the tested wells. U.S. Geological Survey testing found animal waste pollution in drinking water wells in Oklahoma.

Weida (2004) finds that all of this leads to negative economic impacts on nearby property values and the surrounding community. He found that CAFOs lead to reduced property values, fewer jobs, smaller tax base, increased taxpayer-borne expenses such as road repair, and lower or absent economic multiplier effects.¹⁰ Chism and Levins (1994) support this, and specifically found that small farms (that is, farms with gross incomes of \$100,000 or less) make 95% of their expenditures locally. However, large farms (those making more than \$100,000 per year) spend less than 20% locally.¹¹

I have inspected these affected areas twice in recent years. First, I appraised all of the Grove Farm properties in 2008 subsequent to the recent transfer of ownership of this entity. Thus, I inspected every portion of the Grove Farm holdings, including the area designated for this CAFO. Second, from July 13 – 17, I re-inspected the affected area, gave a talk at the community center, met with several public officials including Mayor Bernard J. Carvalho, Jr. and three councilmembers, and met with numerous local property owners.

3. Property Valuation Basics

Animal feeding operations such as this one affect the value of proximate properties in two ways. First, AFOs have a substantial indirect negative impact on surrounding communities, which would include property values in those communities, via shifts in sources of purchases and other inputs in the factors of production¹². Gomez and Zhang (2000) studied 1106 rural communities and concluded that economic growth rates in communities with conventional farming were 55% higher than in those with AFOs. They note that conventional farmers buy most or all of their supplies locally, thus stimulating the local community and, by extension, stimulating the local real estate market. On the other hand, AFOs bypass local retailers and import the factors of production. AFOs exacerbate the economic negative impact by “importing” large quantities of pollution and the attendant costs. They determined that AFOs were responsible for “...disruption of local social and economic systems, pollution problems resulting from

¹⁰ Weida, W.J., *The CAFO: Implications for rural economies in the US*. Global Resource Action Center for the Environment (GRACE), 2004.

¹¹ Chism, J.W., and R.A. Levins. 1994. Farm spending and local selling: How do they match up? *Minnesota Agricultural Economist* 676:1–4.

¹² Miguel Gomez and Liying Zhang, “Impacts of Concentration in Hog Production on Economic Growth in Rural Illinois”, (Illinois State U. working paper presented to the American Agricultural Economics Association, July, 2000).

intensive agriculture, and negative impacts on the quality of life in rural communities.” Hence, local communities suffer the negative economic byproducts without the attendant economic benefits.

Second, at the individual residential appraisal level, the AFO is viewed by market participants as a negative externality. As an externality, it is not typically considered to be economically “curable” under generally accepted appraisal theory and practice. Hence, the value diminution of a property attributable to proximate location of an AFO can be attributed to stigma.

3.1 A primer on property values.

Some of this may appear obvious to readers familiar with home ownership and enjoyment of property rights, but it provides the basis for any consideration of property value diminution. From an economic perspective, the rights enjoyed by a fee-simple owner fall into three categories:

1. Right of use
2. Right of exclusion, and
3. Right of transfer¹³

It is important to note that in the United States, property itself is not “owned,” but rather the rights of the property are owned (Demsetz, 1967, Alchian and Demsetz, 1973). The ability to delineate these rights, and the ability of owners to transfer some or all of these rights voluntarily is a necessary condition for property valuation.

The first of these, the right of use, is generally interpreted to mean that the owner may determine how property will be used, or if it is to be used at all. The right of use is traditionally limited in western culture by both public restrictions (e.g. -- eminent domain, police power) and private restrictions (e.g. -- liens, mortgages). Private restrictions are generally voluntary, and property owners willingly submit to the disutility of such restrictions in trade for some other economic benefit. For example, a property owner will issue a mortgage to a lender in trade for leverage in the purchase. Also, a homeowner will purchase in a subdivision with covenants and restrictions in trade for the assurance of uniform property use within the neighborhood. It is noteworthy to stress that the voluntary acceptance of private restrictions is always in trade for some economic compensation. Impairment places a restriction on the right of use without

¹³ While delineated in one fashion or another in many texts, this specific wording derives from Jaffee, Austin J. and Demetrios Louziotis, Jr., “Property Rights and Economic Efficiency”, Journal of Real Estate Literature 4, July, 1996, pg. 137-162.

some economic compensation. This is illustrated in potential restrictions which may be placed on the use of real estate due to a physical impairment and which can thus limit the property to something less than its highest and best use.

The right of exclusion -- often called the right of exclusive use or right of exclusive enjoyment -- provides that those who have no claim on property should not gain economic benefit from enjoyment of the property. In other words, the right of use is exclusive to the property owner, and any violation of the right of exclusive use typically carries either payment of compensation to the rightful owner or assessment of a penalty. For example, if "A" trespasses on land owned by "B," then "A" will be guilty of a crime and a possible criminal penalty may be in order, as well as civil damages. Physical impairment by a third party is, in effect, a trespass on property rights, violating the right of exclusion.

Society places a high value on the right of exclusion, for justifiable reasons. Exclusion provides that both the current benefits of ownership as well as future benefits accrue only to the rightful owner, and his/her successors and assigns. In the absence of exclusion, the right of use is under constant threat of nullification without just compensation. In an economy without the right of exclusion, property owners would adopt short-term strategies for use, rather than long-term strategies. In an economic sense, this would lead to widespread inefficiency in the allocation of resources. Hence, the right of exclusion carries with it a significant societal good (Snare, 1992), and thus a significant societally-recognized value (Stigler, 1992).

Finally, the right of transfer provides the owner with the ability to swap one resource for another. An impairment restricts the right of transfer, and may in fact destroy the right of transfer altogether.

Real estate economics – and appraisal practice – uniformly recognizes that contamination has a negative impact on property values. Indeed, appraisers are required by the Uniform Standards of Professional Appraisal Practice to consider the impacts of such contamination in the value estimation process.¹⁴

Fitchen (1989) was one of the first to look at the value of the rights of a property owner in the face of impairment – in this case, a toxic chemical pollution. As an anthropologist and a Professor of

¹⁴ This is specifically covered under USPAP Rule 1-2(e). An appraiser may not fail to take physical disutility into account, except through a totally fictional hypothetical condition, the impact of which must be disclosed under USPAP Rule 2-1(c). A thorough discussion of the appraiser's responsibility is also contained in Eaton, J.D., Real Estate Valuation in Litigation (Chicago: The Appraisal Institute, 1995). For specific references, see pages 128, 129, 149-54, and 235-37. It is clear that an appraisal of a residence which fails to account for a physical deficiency such as a failure in the siding would violate the Uniform Standards. As of this writing, all 50 states have adopted these standards or standards consistent with this language as a matter of law or regulation. In addition, adherence to these standards is mandatory for all federally-insured mortgage transactions.

Anthropology at Ithaca College, she looked principally at residential values, and not only at the real aspects of “violation of the home” by contamination (e.g. – carcinogenic effects of polluting chemicals) but also the symbolic interference on what she called “...a threat to the assumptions people have about themselves and the way life is supposed to be.”¹⁵ She continued, “Toxic contamination also attacks the valued institution of homeownership, violating many of the rights that are assumed to flow from the ownership of ones home, including the assumed right to control entry to it...chemical contamination may affect homeowners more seriously than renters, not only in terms of potential financial loss, but also in terms of devaluation of the achieved status of homeowners.”

Edelstein (1986) also dealt with this "home" theme, and he called impairment to or near a residence an “...inversion of home...” when “...the previous locus of family security and identity becomes instead a place of danger and defilement.” He builds on previous works, such as Perin (1977) and Altman and Chemers (1980), who show the very special place the home has in American society, culture, and economics. To quote Perin (1977, pg 129): “Not being a nation of shopkeepers, America is one of homeowners, busily investing in plant maintenance and expansion with both money and time, keeping the product attractive for both use and sale.”¹⁶

Edelstein (1986) specifically stressed the investment diminution aspect of the inversion of home principle. In citing case studies of experiences following neighborhood-wide impairment in the Legler section of Jackson Township in southern New Jersey, he showed that residents could not separate the psychological pride in home ownership from the question of economic value. Surveys of the population found uniformity of opinion that property values had diminished as a result of the problem. While previous studies had focused on the diminution of value from existing homes, Edelstein (1986) was one of the first to focus on the opportunity costs stemming from the inability to move. In short, homeowners were stuck holding unsellable homes with stagnant prices, while homes in other neighborhoods were soaring in value. Thus, the owners were harmed not only by the diminution of value in the existing residences, but by the opportunity costs inherent in lost gains from alternative home investments¹⁷.

Edelstein (1986) referred in a general sense to the issue of **stigma** as a mechanism for manifestation of value diminution in residential property. Stigma is an increasingly common term in the appraisal and real estate economics literature, and refers in fact to a very specific quantitative mechanism by which value is impacted by proximate contamination or negative externalities.

¹⁵ Fitchen, Janet M., 1989, “When Toxic Chemicals Pollute Residential Environments: the Cultural Meanings of Home and Home Ownership”, *Human Organization* 48-4, 313-324.

¹⁶ Perin, Constance, *Everything in Its Place: Social Order and Land Use in America*, (Princeton, NJ: Princeton U. Press, 1977)

¹⁷ Edelstein, Michael R., 1986, “Toxic Exposure and the Inversion of the Home”, *J. Architectural Planning Research* 3, 237-251.

The earliest references to stigma as a quantitative concept in real estate economics appears to be in the writings of Patchin (1991) and Mundy (1992). This latter study differentiated between the costs to cure and stigma. The former is an out-of-pocket expense born by either the property owner or some other responsible party, while the latter manifests in property value diminution even in the absence of a cost to cure. For example, a property which is completely cured may continue to suffer a diminution in value, and hence damages, as a result of stigma.

Kilpatrick, et al., (1999) outlined the quantitative model by which the value of income producing property is reduced by stigma effects, which are manifested via increases in market driven capitalization rates. He outlined four components of income producing property value impacts: Net Operating Income, actual Cost-to-Cure, Ongoing Increases in Maintenance, and Stigma. In his model, the stigma losses actually overwhelm the other three factors as a component of value diminution. He concluded that, under many circumstances, the stigma impacts are actually the greater portion of value losses to property owners¹⁸.

The valuation literature on the impact of air quality on residential property values traces its origins to Ridker and Henning (1967), who used 1960 Census information in St. Louis and measures of both sulfation and suspended particulates to show a direct correlation between poor air quality and property value diminution. In the wake of their groundbreaking hedonic study, the consensus of studies has shown this causal relationship¹⁹.

Deyek and Smith (1974) studied 100 metropolitan areas using 1970 Census data and compared housing values with air pollution. They found a statistically significant relationship between housing values and air pollution across the U.S. Harrison and Rubinfield (1978) examined owner-specific house values in Boston against NO₂ levels and found highly statistically significant value diminution²⁰. Nelson (1978) examined median property values by census tract in Washington, DC, against particulate and oxidant concentration, again finding statistically significant value diminution²¹.

Li and Brown (1980) examined sales prices in suburban Boston towns relative to sulfur dioxide and total suspended particles, and found statistically significant diminution²². Murdoch and Thayer (1988)

¹⁸ Kilpatrick, John, Douglas Brown, and Ronald Rogers, "Performance of Exterior Insulation Finish Systems," *Appraisal Journal*, January 1999

¹⁹ Ridker, Ronald G., and John A. Henning, 1967, "The Determinants of Residential Property Values with Special Reference to Air Pollution," *The Review of Economics and Statistics* 49-2, 246-257

²⁰ Harrison, David, and Daniel rubinfeld, 1978, "Hedonic Housing Prices and the Demand for Clean Air", *J. Environmental Economics and Management* 5, 81-102.

²¹ Nelson, Jon P., 1978, "Residential Choice, Hedonic Prices, and the Demand for Urban Air Quality", *J. Urban Economics* 5, 357-369

²² Li, M., and J. J. Brown, 1980, "Micro-Neighborhood Externalities and Hedonic Housing Prices", *Land Economics* 56-2, 125-141.

used 1979 sales data from California and found property value diminution from a variety of air quality issues²³. Zabel and Kiel (2000) studied nitrogen dioxide and sulfur dioxide in four different urban areas, and consistently found negative property value diminution.

Kiel and Boyle (2001) noted that the most significant air quality studies are those which measure impacts which are important to homeowners. In other words, air quality issues which directly impact homeowners' enjoyment of their property will have a measurable, direct, and statistically significant impact on property values²⁴.

3.2 Pollution Impacts on Nearby Property

Data from the U.S. Department of Agriculture (USDA) and the EPA estimate that livestock in the U.S. produce 130 times the total amount of manure as the entire human population of the country. For example, according to the EPA, one large dairy cow excretes nearly 95 pounds of waste per day. According to a 307 page study by the EPA, published in 2012, their evaluation of the nitrate impact on drinking water wells in the Lower Yakima Valley concluded that 700 mature dairy cows produce a daily waste equivalent to a city of 115,000 people.²⁵ A 2,000-cow factory will thus produce about 95 tons of raw manure a day. This manure contains large amounts of nitrogen gas, phosphorus pentoxide (a powerful irritant and corrosive) and potassium oxide, a highly reactive deliquescent that reacts violently with water to produce potassium hydroxide.²⁶

Reportedly, spills from such AFOs have killed fish in several states; excessive levels of phosphorus in land and water have been correlated with livestock density; and manure has caused eutrophication and degradation of U.S. waterways.²⁷ CAFOs are generally recognized to affect the surrounding environment in several key ways: air quality and odors (ammonia, hydrogen sulfide, methane, and particulate matter), greenhouse gas and climate change, insect vectors (often carrying resistant strains of pathogens), groundwater and surface water contamination, and a variety of pathogens.²⁸

²³ Murdoch, J. and M. Thayer, 1988, "Hedonic Price Estimation of Variable Urban Air Quality", *J. Environmental Economics and Management* 15, 143-146.

²⁴ Kiel, K., and M. Boyle, 2001, "A Survey of House Price Hedonic Studies of the Impact of Environmental Externalities", *J. Real Estate Literature* 9-2, 117-144

²⁵ U.S. EPA Region 10 September 2012, EPA-910-R-12-003, pg 32.

²⁶ Tao, Jing, and Karen Mancel, "Estimating Manure Production, Storage Size, and Land Application Area", Ohio State University, 2008 Agricultural Fact Sheet.

²⁷ Jann, Stephen, "Recent Developments in Water Pollution Control Strategies and Regulations", a talk presented at the ABA's Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations, Minneapolis, MN, May 12, 1999.

²⁸ Hribar, Carrie, Understanding Concentrated Animal Feeding Operations and Their Impact on Communities, National Association of Local Boards of Health, 2010.

On September 15, 2006, the U.S. Food and Drug Administration (FDA) issued a press release informing consumers of an outbreak of E. coli 0157:H7 that began between August 26 and September 12, and was associated with the consumption of fresh spinach. By October 10, there had been 199 reported cases of infection related to this outbreak in 26 states including 31 cases of Hemolytic Uremic Syndrome, 102 hospitalizations and 3 deaths. This stimulated national recalls of fresh-bagged spinach for products either bagged by or purchased from Natural Selection Foods, LLC of San Juan Batista, California. The spinach implicated in the outbreak was grown in the Salinas Valley region of California, which is located 100 miles south of San Francisco Bay Area.²⁹

The FDA released a guide to minimizing Microbial Hazards in 1998, and lists potential sources of this type of contamination including: agricultural water, wild or domestic animals, worker hygiene, production environment (use of manure, previous or adjacent land use), and sanitation of facilities and equipment.³⁰ An *L.A. Times* article concerning the outbreak stated that growers do not draw water from the local surface water source for agriculture use because they are known to be contaminated from AFOs. The Centers for Disease Control, the California Department of Health Services, and the FDA finally traced the source of the contamination to cow manure.³¹

One of the leading causes of food and waterborne illness in the United States is this E. coli 0157:H7 organism. The E. coli 0157:H7 is a specific strain of the *Escherichia coli* bacteria, and it can commonly be found in the intestines of healthy cattle. One of the common means of transfer to humans is when untreated manure is able to enter water sources or used for fertilization.³² AFOs are regarded as potential sources for contamination because of the large amounts of manure that they produce, and the proximity in which the animals are confined allows for disease to be easily transferred.³³ Spillage of animal waste may occur as a result of flooding, leeching into the soil, or through disregard of regulations.

²⁹ "FDA Announces Findings from Investigation of Foodborne E. coli 0157:H7 Outbreak in Spinach U.S. Food & Drug Administration. 2 Oct. 2006, <<http://www.fda.gov/bbs/topics/NEWS/2006/NEW01474.html>>.

³⁰ "Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables." U.S. Food & Drug Administration 28 Sept. 2006, <<http://www.cfsan.fda.gov/~dms/prodguid.html>>.

³¹ "Tainted spinach tied to cattle ranch," Los Angeles Times, March 24, 2007

³² "Disease Listing, *Escherichia Coli* 0157:H7, Gen Info" Center for Disease Control & Prevention 2 Oct. 2006 <http://www.cdc.gov/ncidod/dbmd/diseaseinfo/escherichiacoli_g.htm>

³³ "National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal feeding Operations (CAFOs); Final Rule" Federal Register 68 (12 February 2003)

Because the trend toward CAFOs has been so rapid and pronounced in the U.S., federal and state laws have some gaps. In addition to water quality issues resulting from manure and waste run-off, these facilities attract flies and other insects and then other pests that parasitize the insects.³⁴

Ikerd (1998) notes, "Piling up too much 'stuff' in one place causes problems." Writing about hog CAFOs, he goes on to say, "If you spread out the hogs and let hog manure lay where it falls in a pasture, it doesn't bother anyone very much. But if you start collecting it, flushing it, spreading and spraying it around – all normal practices in confinement hog operations – it becomes air pollution."³⁵

As a result of these problems, many states have enacted restrictions on permitting. For example, in 1997 the legislature of typically livestock-friendly Oklahoma mandated setbacks and other pollution controls, and in 1998 that legislature enacted a moratorium on new livestock permits.³⁶ Kansas, another typically agriculture-friendly state, recently enacted a moratorium on CAFOs and even considered legislation to end CAFOs.³⁷ In 1998, the North Carolina legislature – the home of CAFOs and faced with unregulated establishment of CAFOs in that state -- enacted House Bill 1480, which mandated the registration of growers for integrators, extended a moratorium, and mandated substantial elimination of both atmospheric emission of ammonia as well as odor beyond the boundary of existing AFOs.³⁸ Minnesota had enacted similar odor control legislation in 1997, and established both a complaint control protocol and an enforcement response protocol specific to AFOs.³⁹

In 2000 – 2001, the U.S. Environmental Protection Agency began levying fines against concentrated beef production facilities in the Northwestern U.S. which met two criteria: the facility confined animals for at least 45 non-consecutive days per year and the confinement area was devoid of

³⁴ "Concentrated Animal Feeding Operations – Resources for Environmental Responsibility", working paper prepared by Smith-Comeskey Ground Water Sciences, April 1, 2000. See <http://www.groundwatersystems.com/agwaste.html> for more details.

³⁵ Ikerd, John "Social, Economic, and Cultural Impacts of Large-Scale, Confinement Animal Feeding Operations." Working Paper, University of Missouri, 1998

³⁶ Stephens, Michelle, "NGO and Grassroots Perspectives and Action", a talk presented at the ABA's Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations, Minneapolis, MN, May 12, 1999

³⁷ Myers, Roger, "Graves May Lift Licensing Ban on Large-Scale Hog Farming", The Topeka Kansas Journal, Saturday, January 24, 1998

³⁸ Williams, C. Mike, "CAFO Odor Control Options", North Carolina State University unpublished working paper presented at the ABA's Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations, September 23, 1999.

³⁹ Sullivan, Mike, "Minnesota's Program Regarding Hydrogen Sulfide Emissions from CAFOs", Minnesota Pollution Control Agency unpublished working paper presented at the ABA's Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations, September 23, 1999.

vegetation. The rules generally applied to any operation with 300 head of cattle or more. At the time of the regulations, the EPA estimated that this would affect between 26,000 and 39,000 AFOs in the U.S.⁴⁰

3.3 Empirical Evidence from the Appraisal Literature

The diminution in property values was reinforced by Kim and Goldsmith (2008), who analyzed property values of 2,155 homes located within 3 miles of an AFO in North Carolina. The principle focus of their study was on spatial hedonics, and within a three-mile area, they found the average impact to be *negative* 18%. At one mile, the impact was *negative* 23.5%.⁴¹ Note that their study did not take into account wind patterns. Thus, properties at three-miles up-wind of the facility were averaged with properties three-miles down-wind.

Kueth and Keeney (2012) find that the negative impacts of AFOs are comparable to those generated by industrial waste, solid waste, and septic waste facilities.⁴² They focused on airborne-related problems, and noted that odor is a particular source of nuisance, and higher valued residences are more severely impacted.

The odor and airborne particulate issues have been explored by two studies in Iowa (2002) and two in North Carolina. The first North Carolina study, Schiffman, et al. (1995) reported emotional impacts (tension, depression, anger, reduced vigor, fatigue, and confusion) linked to airborne contamination emanating from an AFO.⁴³ The second North Carolina study, Wing and Wolf (2000), reported increased incidences of headache, runny nose, sore throat, excessive coughing, diarrhea, burning eyes, and “reduced quality of life.”⁴⁴ The first Iowa study, Thu, et al. (1997), found increases in eye and upper respiratory problems among those living within 2 miles of an AFO.⁴⁵ Again, this does not take into account

⁴⁰ Steward, Peggy, “Cattlemen Find CAFO Rules Confusing”, *Capital Press Agricultural Weekly*, March 9, 2001.

⁴¹ Jungik Kim and Peter Goldsmith, “A Spatial Hedonic Approach to Assess the Impact of Swine Production on Residential Property Values”, *Environmental Resource Economics* 42-4, (2008) 509-534.

⁴² Todd H. Kueth and Roman Keeney, “Environmental Externalities and Residential Property Values: Externalized Costs along the House Price Distribution, *Land Economics* 88-2 (2002), 241-250.

⁴³ S. Schiffman, E. Miller, M. Suggs, and B. Graham, “The Effect of Environmental Odors Emanating from Commercial Swine Operations on the Mood of Nearby Residents,” *Brain Research Bulletin* 37 (1995), 369-375.

⁴⁴ S. Wing and S. Wolf, “Intensive Livestock Operations, Health, and Quality of Life Among North Carolina Residents,” *Environmental Health Perspectives* 108, (2000), 233-238.

⁴⁵ K. Thu, K. Donham, R. Ziegenhorn, S. Reynolds, P. Thorne, P. Subramanian, P. Whitten, and J. Stookesberry, “A Control Study of the Physical and Mental Health of Residents Living Near a Large-Scale Swine Operation,” *Journal of Agricultural Safety and Health* 3, (1997), 13-26.

the impact of wind direction. The second, unauthored Iowa study⁴⁶ summarized the extant empirics, including studies of AFO workers, and concluded two things:

1. *There is now an extensive literature documenting acute and chronic respiratory disease and dysfunction among workers, particularly swine and poultry workers, from exposures to complex mixtures of particulates, gases, and vapors.*
2. *It is, therefore, also concluded that CAFO air emissions may constitute a public health hazard.*

In 2008, the EPA published revised regulations which addressed the Federal 2nd Circuit's ruling in *Waterkeeper Alliance v. EPA* (399 F. 3rd 486, 2005). Some aspects were struck down by the 5th Circuit in 2011 (*National Pork Producer's Council v. EPA*), but the remainder of the regulations stand in force, recognizing the significant environmental impact of an AFO.⁴⁷

Extensive studies reveal the impacts of AFOs on community life and values. The 2002 Iowa study cited Gomez and Zhang (2000) who documented the negative impact of AFOs on the economy of the surrounding community, as revealed by sales tax receipts and reduced local purchases.⁴⁸ This finding replicated Abeles-Allison & Connor (1990), who showed that AFOs had the effect of crowding out more traditional farmers, and purchases by those farmers decreased in local stores.⁴⁹ A similar study by Chism & Levins (1994) found that smaller farms made nearly 95% of their expenditures locally, while larger operations spent less than 20% locally.⁵⁰

These problems have been well known and documented by the State of Colorado for some years. In Keske (2012), a study performed for the Colorado State University Extension Office, poultry operations and swine operations were lumped together as generators of biogas, "containing methane and carbon dioxide." The study was conducted to examine the feasibility of anaerobic conversion, and noted that there was a fairly high threshold of cost and requirements for this to be feasible. In support of this, the study documented ten recent lawsuits in which claimants were awarded as much as \$50 million for

⁴⁶ *Iowa Concentrated Animal Feeding Operations Air Quality Study – Final Report*, Iowa State University and the University of Iowa Study Group, (February, 2002).

⁴⁷ "National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal feeding Operations (CAFOs); Final Rule" *Federal Register* 68 (12 February 2003).

⁴⁸ Iowa State University and the University of Iowa Study Group, *Iowa Concentrated Animal Feeding Operations Air Quality Study – Final Report*, (February, 2002).

⁴⁹ M. Abeles-Allison and L. Connor, *An Analysis of Local Benefits and Costs of Michigan Hog Operation Experiencing Environmental Conflicts*, (Department of Agricultural Economics, Michigan State University monograph, 1990).

⁵⁰ J. Chism, and R. Levins, "Farm Spending and Local Selling: How Do They Match Up?", *Minnesota Agricultural Economist* 676, (1994) 1-4.

agricultural nuisance. Notably, the two largest awards cited (\$50 million and \$19 million) were for poultry operations.⁵¹

3.4 Comparable Case Studies

Kilpatrick (2001) presented a series of case studies from the 1990s. For example, a Minnesota homeowner reportedly lived near two swine CAFOs. Her family became ill, and testing found that the level of hydrogen sulfide was well above the danger levels.⁵² Taff, et. al, (1996) performed a hedonic price analysis on 292 rural residences in Minnesota and found a statistically significant pricing impact related both to the existence of an CAFO as well as the distance to the CAFO.⁵³ Palmquist, et al., (1997) quantitatively determined that CAFOs depressed nearby home values and developed a model to measure the spatial impacts of AFOs.⁵⁴

Additional empirical studies have supplemented these findings. Ables-Allison and Connor (1990) were among the first to examine property value impacts resulting from airborne contamination and odors.⁵⁵ Examining 288 sales between 1986 and 1989, they found statistically significant impacts within a 5-mile radius. Notably, during the first half of 1989, they found that a CAFO with greater than 500 animals was 50 times more likely to have an odor complaint lodged with the state than one with fewer than 500 animals.

Hamed, et al. (1999), quantified both the average value impact of a CAFO as well as the impact by distance with a study of 99 rural, non-family real estate transactions of more than one acre near an AFO. Thirty-nine of the properties in the study included a residence. They found statistically significant pricing impacts within three miles. However, if that parcel was located within one-tenth of a mile of the AFO (the minimum unit of measure in their study), then the loss in value was estimated at about 88.3%.⁵⁶

Weida (2001), studied the economic and financial impact of AFOs. While this study principally focused on the diminished economic growth rates in communities surrounding CAFOs, it also noted the

⁵¹ C. Keske, "Determining the Economic Feasibility of Anaerobic Digestion in Colorado: Guidelines for Animal Farm Producers", CSU Extension Fact Sheet 1.229 (2012).

⁵² Presentation at the American Bar Association Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations, September 23, 1999.

⁵³ Stephen J. Taff, Douglas Tiffany, and Sanford Weisberg, "Measured Effects of Feedlots on Residential Property Values in Minnesota: A Report to the Legislature", (U. Minnesota Staff Paper Series, July, 1996).

⁵⁴ R. Palmquist, F. Roka, and T. Vukina "Hog Operations, Environmental Impacts, and Residential Property Values", *Land Economics* (1997).

⁵⁵ Abeles-Allison, M., and L. Connor, *op. cit.*

⁵⁶ Hamed, Mubarek, Thomas Johnson, and Kathleen Miller, "The Impacts of Animal Feeding Operations on Rural Land Values," U. Missouri-Columbia Community Policy Analysis Center Report R-99-02, (May, 1999).

substantial decreases in property values in those areas, as evidenced by property tax reductions.⁵⁷ Weida (2004), found that homes within ½ mile of an AFO decreased in value by 40%, within 1 mile by 30%, 1.5 miles by 20%, and 2 miles by 10%.⁵⁸ Again, this study does not take wind direction into account.

Increasingly, studies have relied on Geographic Information Systems (GIS) technology and other spatial methods to investigate property value impacts. Worley, et al. (2000) utilized GIS to examine the efficacy of buffers to mitigate CAFO impacts.⁵⁹ Milla, et al. (2005), studying homes in Craven County, North Carolina, utilized both GIS and hedonic pricing and determined that a farm with 5,000 animals 1 mile away had a statistically significant impact on home values.⁶⁰ Cajka, et al., (2004), modeled air pollution emanating from CAFOs.⁶¹ Isakson and Ecker (2008) examined the impact of swine facilities and found large adverse impacts within 3 miles, with decreasing but nonetheless adverse impacts beyond 3 miles.⁶²

In 2000, Central Industries operated a large-scale poultry processing plant near Central, Mississippi. As part of the process large quantities of poultry processing, byproducts were brought to this facility for further processing. The plant had been subject to a number of flooding events, when the holding ponds were allowed to overflow into nearby creeks spreading bacteria laced poultry byproducts into those creeks and downstream rivers. Poultry byproducts were discovered in trees, low density livestock areas, crop fields, and personal residences up to 50 miles away from the rendering plant. In a parallel case, the company and its officers of the facility plead guilty to 26 Clean Water Act charges, officers were individually fined varying amounts up to \$300,000 each, and two of them were sentenced to confinement. The company was fined \$14 million⁶³. Researchers found property value diminution of up to 60% for farms closest to the plant, and transaction prices impacted as far as 11 miles away.

Julie Janson lives about 2 miles from one swine CAFO and about ¾ mile from a second AFO in Minnesota. When these CAFOs were first opened, she was initially a supporter. However, she and her family immediately began suffering illnesses which they attributed to the proximate AFOs. She

⁵⁷ William Weida, "A Summary of the Regional Economic Effects of CAFOs," (Colorado College working paper, July 21, 2001).

⁵⁸ Weida, William J., "The CAFO: Implications for Rural Economies in the US," (Colorado College working paper, 2004).

⁵⁹ Worley, J.W., C. Rupert, and L.M. Risse, "Use of GIS to Determine the Effect of Property Line and Water Buffers on Land Availability," *Applied Engineering in Agriculture* 17(1), 49-54, September, 2000.

⁶⁰ Katherine Milla, Michael H. Thomas, and Winsbert Ansine, "Evaluating the Effect of Proximity to Hog Farms on Residential Property Values: A GIS-Based Hedonic Price Model Approach," *URISA Journal* 17-1 (2005) 27 – 32.

⁶¹ Cajka, Jamie, Marion Deerhake, and Chengwei Yao, "Modeling Ammonia Dispersion from Multiple CAFOs Using GIS," *Proceedings of the 24th ESRI Users Conference*, August 9-13, 2004.

⁶² Isakson, Hans R., and Mark D. Ecker, "An Analysis of the Impact of Swine CAFOs on the Value of Nearby Houses," U. Northern Iowa unpublished working paper, July 23, 2008.

⁶³ U.S. Department of Justice Press Release, November 2, 2000.

contacted the Minnesota poison control center and for the first time learned about the dangers of hydrogen sulfide emissions. She kept track of her illnesses and weather conditions (e.g. – wind and direction) and concluded that her illnesses were caused by the emissions from the AFOs. Badge testing was warranted, and on at least one occasion the reading was above 1,000 ppb hydrogen sulfide, well above danger levels.⁶⁴

A 309-acre family farm in Pasco, Washington, had been operated for many years produced alfalfa, asparagus, corn, apples, peaches, nectarines, cherries, melons, and a range of garden produce. A cattle CAFO was located nearby, and as a result their farm product was impacted by dust, flies, fly fecal matter, and odor. The farm was appraised for litigation purposes and a value diminution of over 50% was determined, based on traditional farm appraisal methods.⁶⁵

I examined a 17,000 acre hunting club near Eufaula, Alabama, located several miles downwind from the Charoen Pokphand chicken processing facility. Despite extensive forest lands between the club and the facility, odors and airborne contaminants had driven away the deer and other wildlife, resulting in severely diminished utility of the hunt club.

In numerous counties across the country, tax assessors have granted property value reductions as a result of proximity to CAFOs. Beasley (2001) reported that Clark County, Illinois, established a property tax abatement for 50 homes around a swine CAFO. Homes within ½ mile were determined to be diminished 30%, ranging down to a 10% reduction for homes at 1½ miles.⁶⁶ Again, these do not take wind direction into account.

Table 1
Property Tax Reductions In Areas Around CAFOs

<u>Area</u>	<u>Amount of Reduction</u>	<u>Reduction In Value Of:</u>
Grundy Co, MO	30%	
Mecosta Co, MI initially:	35%	dwelling only
Later changed to:	20%	land and structures
Midland Co, MI	20%	
DeWitt Co, IL	30%	
McLean Co, IL	35%	
DeKalb Co, AL	base reassessment, variable rates	
Renville Co, MN	base reassessment, variable rates	dwelling only
Humbolt Co, IA	20-40% dwelling only	
Frederick Co, MD	10%	
Muhlenberg Co, KY	18%	dwelling only

⁶⁴ Presentation made at the ABA’s Special Committee on Agricultural Management Roundtable II on Environmental Challenges in Animal Feeding Operations, dated September 23, 1999.

⁶⁵ Greenfield Advisors files.

⁶⁶ Lee Beasley, “Cumberland Hog Facility May Affect Clark County Homeowners Property Values”, *Guardian Publishing* (2001).

According to Allen (2002), the Nebraska Court of Appeals ruled that county board of equalization erred in not considering a rural residence's proximity to a swine facility in determining the residence's valuation. The owner of the facility, which contained 5,200 sows, also built a house ¾ of a mile away and had obtained an easement to spray the hog manure on the cropland across the road from the house. The court ordered the county to ignore the fact that the swine were also the property of the owner. The court cited Nebraska livestock nuisance decisions which show that hog odors would influence the home's value. Upon the ruling the county accepted a determination by a local, independent appraiser that the value was diminished 30%.⁶⁷

Spears (2003) reported that in the summer of 2003, health officials declared about 40 kilometers of beaches on Lake Huron permanently unsafe because of E. coli bacteria emanating from nearby AFOs. This became the first new pollution hot-spot on Canada's side of the Great Lakes in almost 20 years. Lab tests demonstrated that the E. coli levels in the streams feeding Lake Huron, and draining off nearby AFOs, exceeded water quality standards by as much as 41,000 percent.⁶⁸

Ready and Abdulla (2005), of Penn State's Agricultural and Environmental Economics Department, expand upon the hedonic analyses of others and reviewed the amenity and disamenity impacts of agriculture in Berks County, Pennsylvania, including different types of open space (publicly owned, eased, vacant, pasture/crops), landfills, airports, mushroom production, and AFOs. The study determined that "...only landfills have a worse effect on adjacent property values."⁶⁹ Further, "...a sewage treatment plant has less depressing effects on nearby housing prices than a factory farm operation..." according to their findings. The study found that the clustering of AFOs within a certain area is the controlling factor not the nearest operation when considering proximity. A threshold impacts of 4.1% from AFOs within 800m, and at least 6.4% from within 500m, both of which were half of a landfill's. The study also reviewed the effects of size, species, and environmental stewardship (registration of waste management plans). Their findings were presented at the Sustainable Hog Farming Summit in Gettysburg, PA, in June, 2003.

Similar to the Berks County study, Herriges, et al. (2003) expands upon the work done in the University of Minnesota & University of Mississippi studies. The variables used to quantify the effects in this hedonic analysis included proximity, size, and direction of nearest facility. Direction from site was included to determine the effect of being downwind and the odor and pest issues associated. Results from

⁶⁷ J. David Aiken, "Property Valuation May be Reduced by Proximity of Livestock Operation" Cornhusker Economics, Department of Agricultural Economics University of Nebraska – Lincoln, (May 2002).

⁶⁸ Spears, Tom, "Ontario's West Coast Permanently Polluted," *The Ottawa Citizen*, (November 15, 2003); also Dines, R.E., Deborah Henderson, and Louise Rock, "The Case Against Intensive Hog Operations," (working paper February, 2004).

⁶⁹ Richard Ready and Charles Abdalla "The Impact of Open Space and potential Local Disamenities on Residential Property Values in Berks County, Pennsylvania" *American Journal of Agricultural Economics*, 87 (May 2005) p. 314-326.

this study determined that a moderate size facility has a measurable impact within 1½ miles and 26% within a ¼ mile⁷⁰. Finally, Keske (2012) documents ten lawsuits over CAFO nuisance in which the plaintiff prevailed, with jury awards ranging up to \$50 million, which I have presented in Table 2 (following).

The establishment of a CAFO results in value diminution to other nearby properties both through a negative externality as well as through indirect economic impacts. The amount of the value loss is an inverse function of distance (closer properties diminish more), a function of property type (newer, nicer residences lose more) and a function of property use (farms will lose value due to diminished productivity and comparative marketability to farm lands further away; residential use will no longer be a highest-and-best use).

Table 2
Jury Awards from Keske (2012)

<u>Year/State</u>	<u>Jury Award</u>	<u>Case/Remarks</u>
1991/NE	\$375,600	Kopecky v. National Farms, swine operation
1996/KS	\$12,100	Swine settlement – parties undisclosed in news article
1998/KS	> \$15,000	Twietmeyer, beef operations (see above)
1999/MO	\$5,200,000	Hanes v. Continental Grain, swine operation
2001/OH	\$19,182,483	Seelke et al v. Buckey Egg Farm, poultry
2002/IA	\$33,065,000	Blass, et. al, v. Iowa Select Farms, swine operation
2004/OH	\$50,000,000	Bear et. al. v. Buckey Egg Farm, et al, poultry
2006/AL	\$100,000	Sierra Club, et. al, v. Whitaker and Sons, swine
2006/MO	\$4,500,000	Turner v. Premium Standard Farms, swine
2007/IL	\$27,000	State of Illinois (respondent unreported), swine

Table 3
Summary of CAFO Impacts

<u>Case Study</u>	<u>Value Loss</u>	<u>Remarks</u>
Ables-Allison & Connor (1990)	Statis. significant within 5 mi	Greatest impact within 1.6 miles
Taff, et al. (1996)	N/A	CAFO sited near older, less-expensive homes
Palmquist, et al. (1997)	9%	Average up to 2 miles
Hamed, et al. (1999)	Up to 88%	Largest loss if within 1/10 mile
ABA Presentation (1999)	N/A	Confirmed respiratory problems
Central Industries (2000)	60% for farms closest to plant	USDOJ cases, values by appraisal
Beasley (2001)	Up to 30%	Impacts 10% at 1½ miles
Allen (2002)	30% @ ¾ mile	Confirmed by court & local appraiser
Spears (2003)	N/A	40km of beaches closed due to CAFO emissions
Herriges, et al. (2003)	26% @ ¼ mile	Moderate sized CAFO, 6% at 1½ miles
Weida (2004)	40% @ ½ mile	10% at 2 miles
Ready & Abdulla (2005)	Statis. Significant within a mile	Roughly ½ of the impact of a landfill
Kim & Goldsmith (2008)	23.5% @ 1 mi	18% average within 3 mile radius
Isakson & Ecker (2008)	44%	Directly downwind & within 2 miles

⁷⁰ Joseph Herriges, Silvia Secchi, and Bruce A. Babcock “Living with Hogs in Iowa: The Impact of Livestock Facilities on Rural residential Property Values,” Iowa State University Center for Agricultural and Rural Development working paper, August 2003.

It is clear from the broad array of empirical studies and case studies that diminished marketability, loss of use and enjoyment, and loss of exclusivity results in a diminishment which can range from 50% to nearly 90% of otherwise unimpaired value for homes which are adjacent to the facility. Negative impacts are noted at distances exceeding 3 miles, and in the case of a flood or other weather event, waste from the facility can be spread over far greater areas (See Table 3).

4. Economic Impacts

As noted earlier, I am not only a real estate appraiser, but a financial economist as well. I hold a Ph.D. in Finance, and have worked as a consulting economist and econometrician for many years. I have been accepted in this role as an expert witness in both state and federal courts.

As also noted earlier, there is ample scholarly and professional research which recognizes that CAFOs have a negative impact on the communities in which they are located. In this section, I will elaborate on that topic, and specifically discuss the county-wide impacts which an economist would expect to occur on this island. I am informed of certain facts which affect my research in this regard:

1. The downwind areas which will be directly affected by this CAFO are more-or-less described in tax maps 2-6, 2-8, and 2-9, referred to as the "South Shore Region."
2. These areas do not include Omao, which is inland from the coastal areas and north of Tax Map 2-6. The directly affected areas are south of Koloa Road from Lawai Valley to Poipu Road and includes the National Tropical Botanical Gardens and the Kukuiula development. The affected areas are also the northern most areas of Tax Map 2-8, north of Koloa, and roughly along the east side of Maluhia Road between Koloa and Kaunualii Highway. This would also include the Koloa Landing Boat Launch as the western boundary and Poipu Kai Resort as the eastern boundary. Note that this includes the Hyatt Hotel and Poipu Bay Golf Course. It includes 4,622 tax parcels.
3. The total assessed value in this directly affected area, as of 2015, is approximately \$3.7 Billion. Note that the county as a whole has an assessed value of about \$20.7 Billion, spread over 33,579 parcels. Thus, the directly affected area constitutes about 17.8% of the whole county value.
4. However, while the directly affected area only constitutes 17.8% of the county value, it generates 24.1% -- nearly one quarter -- of the county tax revenues.
5. In 2015, the Koloa/Poipu region accounted for \$213 million in lodging revenue, or about 31% of the entire island. This mostly comes from the Hyatt, which at about 650 rooms is the largest such facility on the island.

6. Note that the golf course and the Hyatt together paid about \$5 million in property taxes last year, or 4.1% of the county total.
7. Residential, vacation rental, and hotel and resort combined constitute 66.4% of the property taxes paid in this area, or about \$23.5 million. This alone is about 20% of the county's total property tax collections.
8. Finally, tourism accounts for about 2,600 jobs in this area of the island. According to the Kauai Economic Outlook Summary, May, 2016, the total employment on the island at the end of 2015 was about 30,000. Thus, tourism in this region of the island accounts for about 8.7% of the island's total workforce.

Based on the foregoing, several economic issues become evident:

1. This part of the island has a concentration of the specific types of real estate which would be worst affected by a nearby CAFO – residences, tourist rental residences, and up-scale lodging. A 50% reduction in property values across just these three sectors would have a devastating impact on the county's finances. Specifically, a 50% reduction in these values would cause a 10% shortfall in the county's property tax collections.
2. The county would be left with two equally untenable choices. Either a) reduce the county budget by about \$12 million per year, or b) raise taxes in other, unaffected portions of the island. Under option b), a homeowner several miles away, say in Princeville, would feel a 10% increase in property taxes as a result of a CAFO nowhere near his or her property.
3. Anecdotally, I am informed that South Shore hotels and resorts may already be facing convention and party cancellations as a result of fear about the CAFO. This is not surprising – convention and destination party business is typically booked many years in advance.⁷¹ Destination parties, such as weddings, are huge business for a resort and generate revenues for many other businesses in the area.⁷² Hence, a reduction in revenues for area hotels and resorts will have a direct and immediate impact on local jobs.

⁷¹ The American Real Estate Society held its annual meeting on the big island in 2013. It was so impressed with the facility, that it re-booked it for 2017, four years in advance, which was the norm. When increased volcanic activity gave this group pause about the health of its members, it cancelled (in 2015) and paid a \$50,000 fine rather than risk its members. The 2017 meetings will now be held in Florida.

⁷² One resort county's economic development office, which we recently interviewed, employs six people. One of those was taxed exclusively with attracting destination weddings.

4. The reduction in jobs will have an immediate and detrimental impact on the county's finances. As these workers become unemployed, they will have a higher propensity to seek public assistance, which the county will be less able to provide. Ironically, these workers will also be less able to pay their own taxes.

In summary, the establishment of a CAFO will have an immediate, negative impact on the Island's economy, the county government's finances, and the tourism industry. Given the concentration of sensitive jobs in this region, it is ironic that this CAFO is proposed for what is perhaps the worst site on the island, from an economic perspective.

5. The Concept of Kuleana

While this report is focused on the empirical, quantitative economic and property value issues resulting from this proposed CAFO, as an economist with a focus on environmental issues, I would be remiss in not noting the very special environmental quality of the island of Kaua'i. Indeed, among the various Hawaiian Islands, Kaua'i has a very special ecology which is hardly duplicated on other islands. This environmental "specialness" is a vital and valuable economic asset to the island, one which defines the economy of Kaua'i in a way few other places in the world are defined. In the November 27, 2015 issue of *Forbes*, there was a list of the 21 most beautiful places in the world. The first place on this list was Kaua'i.⁷³

Garavoy (2006), writing in the *Harvard Environmental Law Review*, traces this history of Kuleanas from their inception in the mid-1800's to today, and discusses the impact on conservation land trusts.⁷⁴ While her article deals primarily with the legal issue of Kuleanas when a land trust is acquiring conservation property, the overarching tone of the article gives rise to consideration of the Kuleana as both a right and a responsibility. This appears doubly important in the 21st century, as so many threats to the environment and native rights raise their heads.

While I do not claim expertise in Kuleanas or Hawaiian Native culture, I do recognize that there is a very special environment on Kaua'i, and from the perspective of an economist who works frequently in environmental issues, I clearly recognize the need for stewardship over that environment. As an

⁷³ Nace, Trevor, "21 Most Beautiful Places in the World to Visit," *Forbes*, available at <http://www.forbes.com/sites/trevornace/2015/11/27/21-most-beautiful-places-in-the-world-visit/#5be679ef53c3>, accessed July 23, 2016.

⁷⁴ Garavoy, Jocelyn B., 2005, "Ua koe ke kuleana o na kanaka" (reserving the rights of native tenants): Integrating kuleana rights and land trust priorities in Hawaii, *Harvard Environmental Law Review* 29, 523-572.

economist, I would posit that this proposed CAFO is the wrong thing in the wrong place. It brings no positive benefits to the local economy, and yet imposes severe economic and environmental costs on its neighbors and the community as a whole.

6. A Caveat

Please note that while I am a Hawai'i state certified real estate appraiser, I have not performed an appraisal as commonly defined under the Uniform Standards of Professional Appraisal Practice ("USPAP")⁷⁵, and this document does not constitute an appraisal report. That said, I am clearly operating as an appraiser in this assignment, and certain other aspects of USPAP apply to my work in this matter.

Thank you for the opportunity to be of assistance in this matter.

Sincerely,
Greenfield Advisors LLC



John A. Kilpatrick, PhD, MAI, FRICS
Hawaii State Certified (General) Appraiser No. CGA 0001054

Attachment: Summary of Professional Qualifications

⁷⁵ USPAP has been adopted by the State of Hawai'i under Administrative Regulation §16-114-88. I would specifically note from paragraph (C) of that section, "An appraiser shall perform all appraisals, review, or consulting service with impartiality, objectivity, and independence, without any direct or indirect interest in the property."